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Episodic repetitive thought: dimensions, correlates, and consequences

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Repetitive thought (RT) – attentive, prolonged, or frequent thought about oneself and one's world – plays an important role in many models of psychological and physical ill health (e.g., rumination and worry), as well as models of recovery and well-being (e.g., processing and reminiscing). In these models, repetitive thought is typically treated as stable or trait-like. In contrast, episodic RT reflects what people have "on their minds" at a particular point in time. In four studies, young women ($N = 94$), college students ($N = 166$), first-year law students ($N = 73$), and older adults ($N = 174$) described their episodic RT, which was then rated for qualities including valence, purpose, and theme. Episodic RT valence was associated with mood and depressive symptoms both between (Studies 1–4) and within people (Studies 3–4), and it mediated the effects of dispositional coping through emotional approach (Study 1). The effect of episodic RT valence in turn was moderated by other properties of episodic RT, including purpose, "trait" valence, and theme (Studies 1–4). The study of episodic RT complements that of trait RT and allows for observations of how RT and psychological adjustment change in concert and in context, as well as examining how the RT qualities that are not reflected in trait measures affect adjustment.

Keywords: repetitive thought; emotional approach coping; positive affect; negative affect; depression

Repetitive thought (RT), the process of thinking attentively, repetitively, or frequently about oneself and one's world (Segerstrom, Stanton, Alden, & Shortridge, 2003), is a part of many influential models of psychopathology. For example, worry is a cardinal symptom of generalized anxiety disorder; intrusive thoughts are characteristic of post-traumatic stress disorder; and ruminative thought has been suggested as a transdiagnostic factor for depression and anxiety (American Psychiatric Association, 1994; McLaughlin & Nolen-Hoeksema, 2011; Segerstrom, Tsao, Craske, & Alden, 2000). Repetitive thought may also contribute to well-being. For example, cognitive processing of a traumatic event may lead to a sense of

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psychological growth, and reminiscing may prolong the pleasure of positive life events (Bryant, 2003; Tedeschi & Calhoun, 2004).

The relationships among discrete types of trait RT can be understood using a dimensional model in which the discrete types are arrayed based on their empirical similarities and differences to reveal underlying qualitative dimensions (Evans & Segerstrom, in press; Segerstrom et al., 2003; Segerstrom, Roach, Evans, Schipper, & Darville 2010). The first dimension, *valence*, contrasts thoughts with more positive content against those with more negative content. The second dimension, *purpose*, contrasts thoughts with more searching, uncertain qualities against those with more solving, certain qualities. Valence has the strongest relationships with measures of adjustment, as people who report more positively valenced RT also report better psychological, cognitive, and physical health (Segerstrom et al., 2010; Watkins, 2008).

This dimensional model was derived from trait measures of RT. Therefore, it is possible that the dimensions capture only those variations in RT that arose because they interested psychologists enough to develop measures to capture them. It is reassuring then, to find that the same dimensions emerge when people are merely asked to describe what has been ''on their minds'' recently. This means of measuring *episodic* RT is not constrained by investigators' ideas about the qualities of RT. Nonetheless, when young adults were asked to sort others' descriptions of their RT, valence and purpose dimensions emerged, as well as a dimension of *theme* that contrasted intrapersonal and interpersonal content (Segerstrom et al., 2003, Study 2). As was true for trait RT, more positive episodic RT valence correlated with reports of better psychological, cognitive, and physical health, particularly when the thoughts also had solving rather than searching purpose (Segerstrom et al., 2003, Study 3).

The study of episodic RT offers the opportunity to answer important questions about how people think and the consequences of those thoughts for adjustment and health. First, the valence of episodic RT shows some evidence of being trait-like, that is, there are stable individual differences in the propensity to think positively or negatively across multiple assessments. Furthermore, this ''trait'' variance derived from episodic RT descriptions correlates with valence derived from trait measures (Roach, Salt, & Segerstrom, 2010; Segerstrom et al., 2010). Whether episodic RT mediates the effects of trait RT on adjustment, however, is not known, and this is an important step in determining the validity of both trait and episodic measures. Second, although there is some evidence for stability, there is also evidence that a good part of episodic RT valence and almost all of episodic RT purpose varies across assessments (Roach et al., 2010). Although people tend to think positively or negatively, sometimes they think more positively than other times. Furthermore, they alternate between searching and solving, with no evident propensity to be searchers or solvers. The covariation of these fluctuations in RT with adjustment *within people* is an important next piece of evidence for demonstrating the potential influence of RT on well-being.

The present paper describes results from four studies that assessed episodic RT and various measures of psychological adjustment, including positive and negative affect, thought impact, and depressive symptoms. We predicted that more positive and less negative episodic RT valence would be associated with better psychological adjustment both within and between people, and that episodic RT valence would mediate the effect of a specific form of trait RT, coping through emotional approach,

on adjustment. We also tested models in which the effect of episodic RT valence was moderated by other factors: Previous research indicates that the effect of valence may be stronger when thoughts also have solving purpose or intrapersonal (vs. interpersonal) theme (e.g., Segerstrom et al., 2003, Study 3). Across all four studies, the evidence shows that episodic RT dimensions were assessed with good reliability and validity, related to psychological well-being, and revealed important qualities of the dynamics of RT that cannot be captured with trait measures.

Study 1

Managing one's emotions poses one of the major demands of daily life. Emotion regulation through *emotional approach* (EA) comprises intentional efforts to manage stressful experiences through acknowledging, attempting to understand, and expressing associated emotions (Stanton, Danoff-Burg, Cameron, & Ellis, 1994; Stanton, Kirk, Cameron, & Danoff-Burg, 2000). The emotional processing component of EA clearly falls in the domain of RT, but little is known about the episodic thoughts of people who endorse high levels of EA and whether episodic RT content mediates the effects of trait EA.

In multidimensional scaling of trait RT (Segerstrom et al., 2003, Study 1; Segerstrom et al., 2010), emotional processing was the most positively valenced RT trait measure. Therefore, our primary prediction was that women who typically employ EA also have more positively valenced episodic RT and enjoy salutary psychological consequences of those thoughts. We hypothesized that valence would mediate the relation between EA and these outcomes. With regard to RT purpose, although emotional processing was located in a solving quadrant in undergraduates, it was located in a searching quadrant in older adults (Segerstrom et al., 2003, 2010). Therefore, it is not clear that EA is strongly associated with the purpose dimension. This ambiguity with regard to the relationship between EA and purpose indicates that it is possible that EA is associated with a range of purpose in specific thoughts that maximizes adaptive consequences, depending on circumstances and other RT qualities (Stanton, 2011).

Method

Participants and procedure

The present study examined the episodic RT associated with EA in young women. We elected to use women as participants because evidence suggests that coping through EA is more beneficial for young women than young men (Stanton et al., 1994), and we wanted to examine the degree to which the qualities of episodic RT were responsible for the benefits of trait EA. Participants were 94 women enrolled in introductory psychology courses at two large Midwestern universities who reported episodic RT typically lasting at least 30 minutes/day. They had a mean age of 19 (SD = 1.8 years); 87 were white, 4 African-American, 1 Asian-American, 1 Latina, and 1 was multiracial. Participants completed questionnaires in individual sessions. The study was approved by the University of Kentucky and University of Kansas Institutional Review Boards.

Measures

Emotional Approach Coping. The Emotional Approach Coping scale measures the degree to which people cope with stress by identifying, processing, and expressing emotions (Stanton et al., 2000). Because the emotional processing and emotional expression subscales were highly correlated in this sample ($r = .97$), the total scale ($\alpha = .83$) was used. The scale was administered in its trait version, with the instruction to indicate what "you generally do, feel, and think when you experience stressful situations." The mean item score in the sample was 3.0 (SD $= .6$) on a scale of 1–4.

Episodic repetitive thought. Participants were asked to describe their RT in writing as follows:

> Think of something that has been on your mind lately; that is, you have thought about it frequently and/or for extended periods of time. In the following space, please provide a detailed description of your thoughts. In addition to describing what you have been thinking about, please also include how you have been thinking about the topic, for example, where and when you have the thoughts and the kind of thoughts they are. (Segerstrom et al., 2003).

Participants were given 10 minutes to complete their descriptions, which were then evaluated using the Repetitive Thought 2-Dimensional rating system (RT2D; Segerstrom et al., 2003). Three independent raters coded each description for its valence ($\alpha = .92$), where 1 = very positive and 5 = very negative, and purpose ($\alpha = .88$), where 1 = almost entirely solving and 5 = almost entirely searching. Valence ratings considered whether the individual was thinking about a positive topic (e.g., achievement, recreation, love) or negative topic (e.g., conflict, failure), but raters were instructed and trained to ignore emotional statements (e.g., "It makes me feel happy") in order to avoid criterion contamination with measures of affect. Purpose ratings considered whether the person was solving (e.g., making sure, declaring knowledge, or planning) or searching (e.g., exploring, expressing uncertainty). Mean valence was 4.0 (SD $= 1.1$), and mean purpose was 2.3 (SD $= 1.2$). Purpose and valence ratings were not significantly correlated, consistent with their conceptualization as orthogonal dimensions of RT ($r = .13$, ns).

Subjective ratings and Linguistic Inquiry and Word Count (LIWC) text analysis were used to assess validity. Participants rated their own appraisals of the thoughts using 7-point Likert scales that included items measuring valence (with anchors positive and negative) and purpose (mean of two items, with anchors resolved and unresolved and certain and uncertain, respectively; $r = .46$, $p < .05$). The LIWC text analysis program (Pennebaker & Francis, 1996) was used to code linguistic indicators of valence and purpose. The pre-existing categories of Positive Emotion and Negative Emotion words were used to define valence (valence = negative emotion – positive emotion). The pre-existing category of Cognitive Processes contained both searching and solving words. Therefore, a custom dictionary was created with categories of Searching (e.g., ask, bewildered, doubt, guess, learn) and Solving (e.g., accept, believe, definite, figure, hence) separately. Texts were also modified such that negations were recognized as such (e.g., "don't

know'' was edited to ''nknow'') and scored in the appropriate direction. The Searching and Solving categories were used to define purpose (purpose = searching – solving).

Adjustment. Participants completed the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) and the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), both with regard to the RT in the description. The IES was employed as a measure of negative thought impact, as it assessed the degree to which thoughts were uncontrollable, intrusive, and unwanted. Mean impact was 33.6 (SD = 12.6) on a scale of 0–75. Mean positive affect was 2.6 (SD = 0.8) and negative affect was 2.5 (SD = 0.8), both on a scale of 1–5.

Results

RT2D-derived valence and purpose in episodic RT showed good convergent and divergent validity. The mean correlation of RT2D valence and purpose with self-report and text analysis was $r = .59$ ($p < .05$) for valence and $r = .42$ ($p < .05$) for purpose. In contrast, the correlations between self-report and text analysis ($r = .37$, $p < .05$, for valence and $r = .12$, $p > .05$, for purpose) were smaller than the correlations between them and the RT2D dimensions. All comparisons were significant at $p < .05$ except for the difference between the RT2D-text analysis correlation, $r = .48$ and the self-report-text analysis correlation, $r = .37$, for which the significance level was $p = .06$. Convergent correlations with RT2D dimensions were also substantially higher than the method correlations (i.e., the correlation between valence and purpose for each method), which averaged $r = .10$, and the divergent correlations (i.e., the correlation between one dimension using one method and the other dimension using another method), which also averaged $r = .10$. Because the RT2D method appeared to capture the most variance in episodic RT and to do so reliably, these ratings were used for all further analyses.

The primary hypothesis was that women who reported higher EA would have more positive RT. EA was associated with more positively and less negatively valenced RT ($r = -.22$, $p < .05$) as well as more solving and less searching purpose ($r = -.17$, $p < .05$). In addition, the relationship between EA and RT valence varied depending on RT purpose. After controlling for main effects of EA and purpose, the interaction between them significantly predicted RT valence ($\beta = .27$, $\Delta R^2 = .08$, $F(1, 89) = 8.61$, $p < .05$). In this interaction, women low in EA had generally negative RT; however, women high in EA were characterized by positive RT when solving but by negative RT when searching. This pattern would suggest generally positive RT associated with EA but also flexibility in combining RT content and purpose.

Women who were higher in EA also reported more positive adjustment associated with their thoughts, including less impact ($r = -.25$, $p < .05$) and negative affect ($r = -.21$, $p < .05$) and more positive affect ($r = .43$, $p < .05$). More positive episodic RT was also associated with less impact ($\beta = .24$, $\Delta R^2 = .05$, $p < .05$) and negative affect ($\beta = .47$, $\Delta R^2 = .21$, $p < .05$) and more positive affect ($\beta = -.53$, $\Delta R^2 = .27$, $p < .05$). In addition, relationships of valence to impact and negative

affect were moderated by purpose ($\beta = -.34$, $\Delta R^2 = .09$, $p < .05$, and $\beta = -.21$, $\Delta R^2 = .04$, $p < .05$, respectively). In both cases, the relationship between valence and these negative aspects of adjustment was stronger when the RT was solving (i.e., the thoughts had solving, certain, or declarative versus searching, uncertain, or questioning qualities; see above) (see Figure 1). Therefore, RT was associated with the least negative impact and affect when it was positive and solving. As described above, this combination was particularly characteristic of women high in EA.

The relationship between EA and thought impact ($r^2_{\text{sp}} = .065$) was substantially decreased after controlling for RT dimensions ($r^2_{\text{sp}} = .016$), and the relationship between EA and positive affect ($r^2_{\text{sp}} = .184$) was also substantially decreased after controlling for RT main effects ($r^2_{\text{sp}} = .092$). The relationship between EA and negative affect ($r^2_{\text{sp}} = .048$) was substantially decreased after controlling for RT main effects ($r^2_{\text{sp}} = .015$), and controlling for their interaction further reduced the relationship ($r^2_{\text{sp}} = .008$). Therefore, women who endorsed coping through EA had less impact, more positive affect, and less negative affect during their RT mainly due to more positive episodic RT content; however, an optimal combination of valence and purpose may also have played a role in the relationship to negative affect.
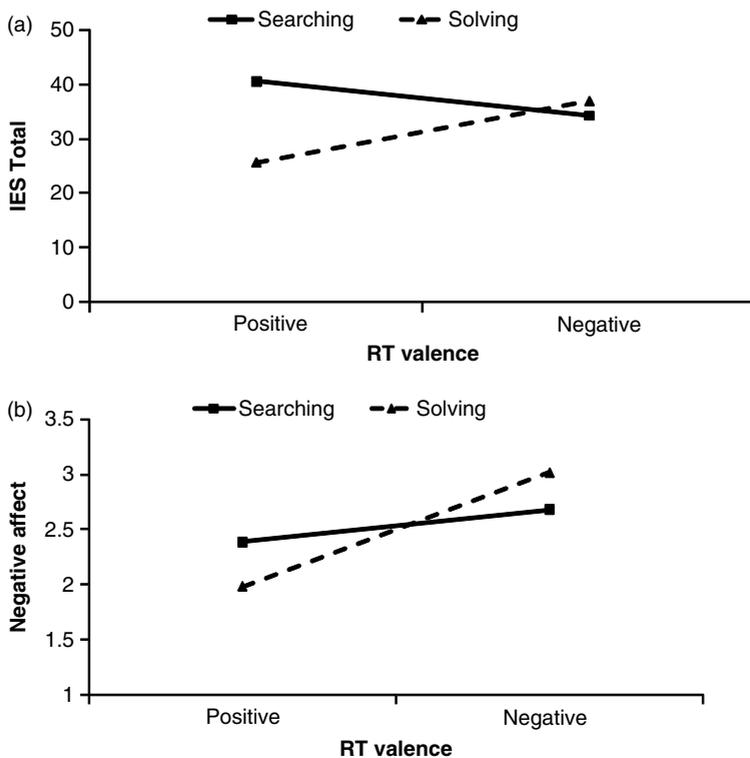

Figure 1.   (a) Relationship of episodic repetitive thought qualities to thought impact in Study 1. (b) Relationship of episodic repetitive thought qualities to negative affect associated with the thoughts in Study 1.

Discussion

The findings of Study 1 support the hypothesized conceptual chain in which trait EA predisposed to more positive episodic RT, and more positive episodic RT predisposed to less thought impact, more positive affect, and less negative affect. Women endorsing high EA were particularly likely to have positive thoughts when solving; when searching, their thoughts were equally negative as women endorsing low EA. In a cross-sectional design, it is not possible to conclude that EA confers the ability to flexibly adapt RT to situational and coping demands. However, this pattern of results suggests the possibility that women who are high in EA may be most likely to adopt a positive, optimistic view of their circumstances when those circumstances are clear and a negative, skeptical view of their circumstances when those circumstances are unclear. Skepticism during the process of weighing alternatives – a process associated with searching – is thought to be adaptive, as is optimism when actions and goals are clear (Taylor & Gollwitzer, 1995). EA may facilitate these stances. In turn, RT qualities accounted for some of the adjustment benefits of EA. Specifically, RT qualities explained the relation of high EA with lower impact and more positive and less negative affect. These findings are consistent with the contention that EA can facilitate positive psychological adjustment at least in part through specific, adaptive cognitive processes (e.g., Levenson, 1994; Stanton et al., 2000, Study 3).

A secondary goal of Study 1 was to provide additional evidence for the validity of the RT2D coding system. Vis à vis subjective appraisals and text analysis of RT descriptions, RT qualities assessed by trained coders appeared superior in their evidence of convergent and discriminant validity. These findings suggest that the RT2D coding method should presently be considered the preferred method for quantifying episodic RT. This is a more labor-intensive system than the use of self-report or automated analysis, but it also captures variance associated with both methods and as such better assesses the content of episodic RT.

Study 2

The results of Study 1 and other analyses of episodic RT suggest that valence is a more trait-like quality of RT, whereas purpose may be more situational (e.g., Roach et al., 2010; Segerstrom et al., 2010). One theory that could shed light on when or why people search or solve is temporal construal theory (Liberman & Trope, 1998). Events that are perceived to be in the distant rather than near future are construed on a higher level (i.e., more abstractly and with less detail) and are less likely to be addressed with concrete, analytical reasoning and problem-solving (Förster, Liberman, & Friedman, 2004).

The design of Study 2 centers on the thioamine acetylase (TAA) deficiency paradigm (Jemmott, Ditto, & Croyle, 1986). This paradigm involves testing individuals for TAA, a fictional genetic disorder, with the manipulation involving different facts about the disorder: in this case, severity and time course. We predicted that higher severity would generate more negative episodic RT and later onset would generate a higher-level construal and, therefore, more searching RT. We also tested the relationship of these episodic RT qualities to changes in positive and negative

affect from pre-test to post-test, thereby extending the static design of Study 1 to a dynamic design that examines *change* in affect.

Method

Participants

Participants were recruited using an online experiment sign-up associated with an introductory psychology class and received course credit for participation. Eligibility criteria included age 18–24 and no known serious health conditions. A total of 197 students participated in the study, but 31 were excluded due to suspicion regarding the experimental manipulation.

Procedure

Participants met in small groups. An experimenter introduced herself as a member of the university biomedical research association who was conducting research on a specific enzyme deficiency disorder (TAA deficiency). For the severe level of the symptoms factor, the deficiency was described as causing memory loss; for the mild level, mild stomachache or heartburn. For the early-onset level of the time factor, the disorder was described as having an onset before age 25; for the late-onset level, after age 65. The severity and time factors were fully crossed in this 2×2, between subjects design.

   After hearing the description of the disorder, participants entered individual testing rooms and were given a test strip to put under their tongues. They then were instructed that they would receive their results in approximately 20 minutes. In the meantime, they were asked to complete questionnaires regarding their reactions to the testing. Participants were then probed for suspicion and fully debriefed. The study was conducted with the approval of the University of Kentucky Institutional Review Board.

Measures

Manipulation check. Participants were asked "If you test positive for TAA, at what age do you think you would start to experience symptoms?" and "How severe do you think the symptoms of TAA are?" ($1 =$ not at all severe to $5 =$ extremely severe). Participants in the "early onset" condition estimated onset to be significantly earlier ($M = 28$) than those in the "late onset" condition ($M = 40$; $F(1,143) = 103.37$ $p < .05$). Participants in the "severe" condition rated the symptoms as more severe ($M = 3.0$) than those in the "mild" condition ($M = 2.3$; $F(1,143) = 14.22$, $p < .05$). Therefore, the manipulation was at least partially successful in manipulating perceived age of onset and perceived severity.

Episodic RT. During the waiting period, participants were asked to "give a detailed description of your thoughts during this experience" and instructed to write for at least 10 minutes. Two independent raters subsequently rated each description for valence ($\alpha = .81$) and purpose ($\alpha = .80$).

Adjustment. Adjustment was measured using the Affect Balance Scale (Derogatis, 1975), which yields scores for positive affect ($\alpha = .95$) and negative affect ($\alpha = .90$). The scale was administered twice: before the "disorder" was described and after the "test" was administered. Participants' positive affect (on a scale of 1–5) significantly decreased from the initial measurement ($M = 3.53$, SD $= .54$) to after the manipulation ($M = 2.74$, SD $= .82$), $t(132) = 13.01$, $p < .001$, $r = .55$. Surprisingly, negative affect (on a scale of 1–5) also decreased slightly from the initial measurement ($M = 1.77$, SD $= .46$) to after the manipulation ($M = 1.46$, SD $= .39$), $t(132) = 7.95$, $p < .001$, $r = .46$.

Results

The primary analysis predicted episodic RT valence and purpose from time and severity. Although participants in the severe symptom condition had slightly more negative thoughts ($M = 2.8$, SD $= 1.1$) than those in the mild symptoms condition ($M = 2.6$, SD $= 1.0$), there were no significant effects of time, severity, or their interaction on episodic RT dimensions. Although the manipulation did not affect RT dimensions, naturally occurring differences in valence and purpose predicted affect. There was a significant valence by purpose interaction predicting positive (but not negative) affect after the test, controlling for affect before the test ($\beta = -.13$, $\Delta R^2 = .17$, $p < .05$). In this interaction, more positive thoughts were associated with more positive affect, and this relationship was strongest when thoughts were also solving: in particular, negative valence was associated with the least positive affect when combined with solving (see Figure 2).

Discussion

Previous studies demonstrated that thought purpose is not solely determined by stable individual differences (Roach et al., 2010), but these studies were conducted in naturalistic settings in which the situational factors that could influence purpose were hard to determine. In Study 2, future event imminence and severity were
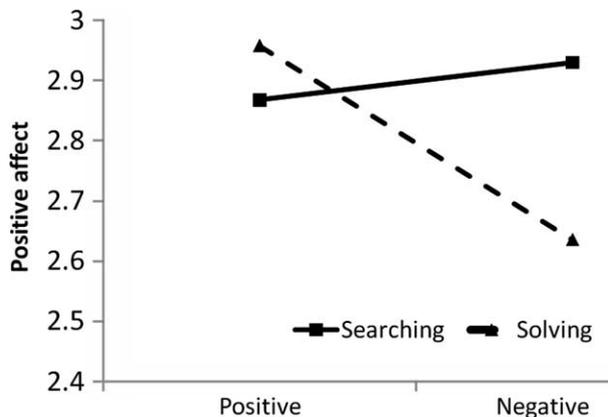
Figure 2. Relationship of episodic repetitive thought qualities to change in positive affect in Study 2.

manipulated but showed no effect on RT purpose or valence. Therefore, fluctuation in qualities of episodic RT, particularly purpose, may arise more from individual differences than from environmental cues. Rather than *stable* individual differences, however, these may be "if-then" profiles in which people have typical but idiosyncratic ways of thinking about themselves and their worlds (Mischel & Shoda, 2008). That is, although episodic RT valence and purpose may vary across situations, their levels are idiographic and not driven solely by external circumstances.

Although valence and purpose were not successfully manipulated, they did have the expected relationships to adjustment. As predicted, more positive episodic RT was associated with more positive affect and – as in Study 1 – this relationship was mainly true when thoughts were also solving. This amplifying effect of solving on valence was also found in a sample of women in a breast cancer chemoprevention trial (Segerstrom et al., 2003, Study 3). It is possible that the uncertainty associated with searching leaves a metaphorical door open from both positive and negative topics, reducing the effect of each (though see Wilson, Centerbar, Kermer, & Gilbert, 2005, for amplifying effects of experimentally manipulated uncertainty on positive affect.)

One difference was that the interaction in Study 2 was obtained with positive but not negative affect; in Study 1, the interaction was obtained with negative but not positive affect. The studies used different measures of affect, which could account for this difference; it may also be that repetitive thought is associated with more static aspects of negative affect (i.e., in the cross-sectional design of Study 1) and more dynamic aspects of positive affect (i.e., in the dynamic design of Study 2).

Study 3

Study 1 suggested that women high in emotional approach might have more variable or flexible episodic RT qualities, engaging in more searching with negative thoughts and solving with positive thoughts. Study 2 suggested that episodic RT qualities might arise ideographically rather than being dictated by information from the environment. Both studies found valence to be the primary correlate of psychological adjustment, with this relationship particularly strong when thoughts were also solving, and both imply that flexibility or change in episodic RT across circumstances may be important in predicting adjustment.

In Study 3, we specifically address change in episodic RT across situations and how it may covary with emotional adjustment. This study assessed episodic RT over five waves during the first year of law school. The waves varied in terms of their average perceived stress, with some waves being less stressful (e.g., before starting law school) and others perceived as highly stressful (e.g., the first exam period) (Roach et al., 2010). We could, therefore, test the hypothesis that within-person change in episodic RT predicts psychological adjustment.

Method

Participants

Participants were first-year law students ($N = 73$) in good mental and physical health. They were 59% female and 41% male; 68 were white, 1 Asian-American, 2

African-American, and 2 multiracial. Comparison of LSAT scores with the total student body suggested that the sample was academically representative.

Procedure

Participants completed five assessments during the course of the first year of law school: before the fall semester began; 8 weeks later, midway through the fall semester; 8 weeks later, during the fall exam period; approximately 4 weeks later, at the beginning of the spring semester; and 4 weeks into the spring semester. At each assessment period, participants completed a packet of questionnaires including a description of their episodic RT about law school and mood ratings. The study was conducted with the approval of the University of Kentucky Institutional Review Board.

Of the 365 possible waves, 349 were completed (96%). Four participants completed 4 waves; 2 participants, 3 waves; and 7 participants, 1 wave. However, all available data from all participants were used in the multi-level models, which do not require listwise deletion in the case of missing waves.

Measures

Episodic RT. At each wave, participants completed descriptions of episodic RT as described above regarding their thoughts about law school. Three raters subsequently rated each description for valence ($\alpha = .94$) and purpose ($\alpha = .90$).

Adjustment. Adjustment was measured using the PANAS-X (Watson & Clark, 1994). Participants completed the measure of affect on 6 days at each wave. These ratings were reliable within waves ($\alpha = .83 - .90$ for positive affect; $\alpha = .85 - .90$ for negative affect), and so the average across days at each wave was used. Mean positive affect across people and waves was 2.5 ($SD = 0.7$), and negative affect was 1.6 ($SD = 0.6$), both on a scale of $1 - 5$.

Results

RT2D ratings of valence and purpose across all people and waves indicated that thoughts about law school were more negative than positive ($M = 3.8$, $SD = 1.1$), but changed significantly across waves, with the most positive thoughts occurring before the start of law school ($M = 3.7$, $SD = 1.1$) and the most negative thoughts occurring during the exam period ($M = 4.2$, $SD = 1.1$; $F(4, 224) = 4.41$, $p < .05$). In contrast, there were no effects of wave on purpose ($M = 2.0$, $SD = 1.1$). Note that previous analysis of these data indicated that these mean differences were found in the context of significant and much larger idiosyncratic changes in valence and purpose across waves; that is, valence and purpose both changed across waves, but differently for different people (Roach et al., 2010). It was this change over time that was used to predict variability in positive and negative affect.

Multi-level models were employed that had people at the higher level and waves at the lower level and separated within-person ("state") and between-person ("trait") variance in RT dimensions (Enders & Tofighi, 2007). All effects were tested with

$\alpha = .05$. The effect size η was calculated from the F test associated with each effect in SAS PROC MIXED; this effect size is analogous to r.

Regarding the prediction of positive affect, more "trait" or average negative valence predicted less positive affect across all waves ($\gamma = -.25$, SE $= .10$, $t(70) = 2.61$, $p < .05$, $\eta = .30$), and fluctuations in "state" negative valence predicted changes in positive affect from wave to wave in the same direction ($\gamma = -.11$, SE $= .03$, $t(239) = 3.44$, $p < .05$, $\eta = .17$). The interaction between "trait" and "state" valence indicated that the effect of "state" valence on positive affect was stronger for people with more negative "trait" RT ($\gamma = -.11$, SE $= .05$, $t(239) = 2.15$, $p < .05$, $\eta = .14$; see Figure 3a).

Similar results obtained for negative affect. There was a tendency for more "trait" or average negative valence to predict more negative affect across all waves ($\gamma = .15$, SE $= .08$, $t(70) = 1.81$, $p < .08$, $\eta = .21$) and a significant effect in which fluctuations in "state" negative valence predicted changes in negative affect from wave to wave in the same direction ($\gamma = .11$, SE $= .03$, $t(239) = 4.18$, $p < .05$, $\eta = .24$). As was true for positive affect, the effect of "state" valence on negative affect was stronger for people with more negative "trait" RT ($\gamma = .08$, SE $= .04$, $t(239) = 1.97$, $p < .05$, $\eta = .13$; see Figure 3b).

Interactions between valence and purpose were tested both within and between levels (e.g., trait by trait interactions, state by state interactions, and trait by state interactions). However, none of these interactions was statistically significant.
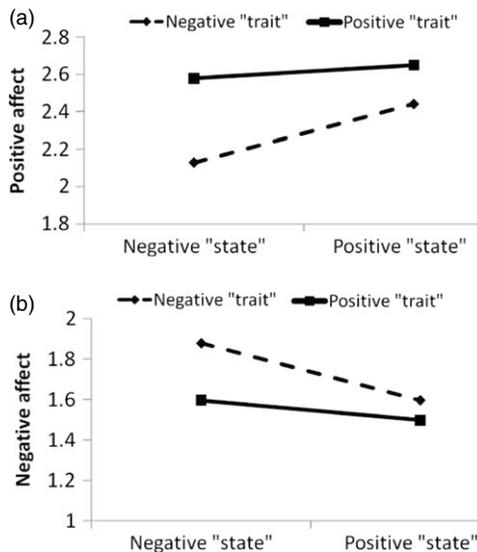

Figure 3. (a) Interaction between average, "trait" RT valence ($+$ and -1 SD) and changes in "state" RT valence ($+$ and -1 SD) predicting positive affect in Study 3. (b) Interaction between average, "trait" RT valence ($+$ and -1 SD) and changes in "state" RT valence ($+$ and -1 SD) predicting negative affect in Study 3.

Discussion

As in the cross-sectional analysis in Study 1 and the pre-test – post-test analysis in Study 2, the valence of episodic RT was the strongest correlate of positive and negative affect. However, the longitudinal design of the present study allowed for tests of whether it was important to one's mood to be a positive or negative thinker, to have more or less positive thoughts at a specific wave, or both. The answer was, both. There were main effects of valence both within and between people, so both people who were positive thinkers and waves at which people had their most positive thoughts associated with more positive and less negative mood. Of course, only episodic RT (and not trait RT) can account for the changes in mood across waves.

Although some waves were associated with more negative RT than other waves, previous analyses of the variance in these data revealed that the person by wave interaction accounted for much more variance (Roach et al., 2010), and supplemental analyses controlling for ratings of law school stress had little effect on the present findings. Therefore, as in Study 2, idiosyncratic if-then profiles appeared to characterize the quality of episodic RT and account for changes in affect. Furthermore, only the repeated measurement of episodic RT could have also revealed the interaction between "trait" and "state" episodic RT valence. In these interactions, people who had typically positive "trait" RT were less affectively vulnerable to state fluctuations in episodic RT. Therefore, more positive trait RT (EA in Study 1 and average episodic RT in Study 3) does not necessary preclude valence fluctuations in state RT, but it does seem to buffer against affective consequences of negative valence when it does occur.

Study 4

In Studies 1–3, naturally occurring individual differences and changes in the valence and purpose of episodic RT were associated with individual differences and changes in emotional adjustment. Valence and purpose are robust descriptive dimensions of episodic RT and appear to be largely exhaustive of the variation in *trait* RT measures (Evans & Segerstrom, in press; Segerstrom et al., 2003, 2010). However, they are not exhaustive in describing *episodic* RT (Segerstrom et al., 2003). In Study 4, we use data from a longitudinal study of older adults to explore an additional dimension of episodic RT.

Multidimensional scaling of episodic RT generated a third descriptive dimension: interpersonal vs. intrapersonal theme (Segerstrom et al., 2003, Study 2). The combination of intrapersonal (i.e., self-focused) theme and negative valence may be particularly characteristic of poor emotional adjustment generally and depression specifically. When depressed and nondepressed college students were presented with successes and failures, depressed students responded with more self-focus and maintained it for a longer period of time than did the nondepressed students (Ingram, 1990). Self-focus also associated with depression in cross-sectional questionnaire studies (Ingram, 1990). Subclinical and clinically depressed outpatients had significantly more self-focus than community controls (Ingram, Lumry, Creut, & Sieber, 1987). Therefore, we predicted that the combination of negative and intrapersonally focused episodic RT would be most closely related to depressive symptoms.

Method

Participants

Participants were community-dwelling adults ($n = 174$), 60 years old or older and in good physical and mental health. They were 60% female and 40% male; 167 were white and 7 were African-American. The mean age of the sample was 75, with a range of 60–93. All participants were married, but no dyads were included to avoid dependency in the data.

Procedure

Participants were mailed a form to complete episodic RT descriptions and ratings in advance of a home visit from an interviewer, who administered other measures in person. Visits were approximately 6 months apart. The present data arise from 844 visits collected over a period up to 8 years. The study was conducted with the approval of the University of Kentucky Institutional Review Board.

    The number of available visits ranged from 1 to 16, with a median of 5. As in Study 3, all available data from all participants was used in the multi-level models, which do not require listwise deletion in the case of missing visits. The number of visits was not related to gender ($r = .06$, $p > .05$) or depression scores at the first visit ($r = -.08$, $p > .05$). However, older age was modestly but significantly associated with fewer visits ($r = -.22$, $p < .05$), which is to be expected as older participants are more likely to die or to drop out due to failing health.

Measures

Episodic RT. At each wave, participants completed descriptions and ratings of episodic RT as described above. Two raters subsequently rated each description for valence ($\alpha = .94$), and theme (interpersonal vs. intrapersonal, where higher scores indicate more interpersonal content; $\alpha = .90$). Mean valence across people and waves was 3.6 (SD = 1.2), and mean theme was 2.5 (SD = 1.0), both on a scale of 1–5.

Adjustment. Adjustment was measured using the Geriatric Depression Scale (GDS; Yesavage et al., 1983), a self-report depression measure designed for use in elderly populations. Three of the questions found in the GDS reflect RT and were not included in the total score so as to avoid criterion contamination: "Are you bothered by thoughts you can't get out of your head," "Do you frequently worry about the future," and "Do you worry a lot about the past?" Reliability of the GDS in this sample across visits ranged from .77 to .85; mean GDS score across people and waves was 3.8 (SD = 3.4).

Results

As described above, multilevel models had people at the higher level and waves at the lower level, and the episodic RT predictors, valence and theme, were centered so as to separate their between-person, "trait", and within-person, "state" variance. As one would expect, valence predicted depressive symptoms both at the "trait" and "state" levels. Higher "trait" or average negative episodic RT predicted higher depressive
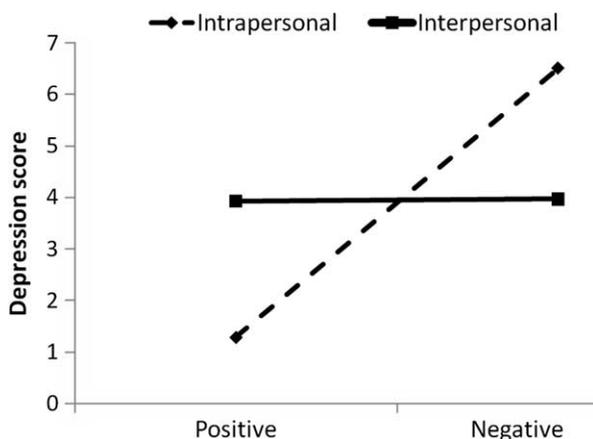
Figure 4. Interaction between "trait" valence (most positive to most negative) and "trait" theme (most intrapersonal to most interpersonal) predicting depression in Study 4.

symptoms across all waves ($\gamma = 1.10$, SE $= 0.30$, $t(165) = 3.61$, $p < 0.05$, $\eta = .27$). Fluctuations in "state" RT predicted changes in depression from wave to wave, such that at times when people had more negative episodic RT than they usually did, they also had higher levels of depressive symptoms than usual ($\gamma = 0.26$, SE $= 0.07$, $t(672)$; $p < 0.05$, $\eta = .09$). As predicted, the effect of valence was strongest when the theme of the thoughts was also self-focused. This was primarily true at the between-person, "trait" level ($\gamma = -1.05$, SE $= 0.40$, $t(165) = 2.68$, $p < 0.05$, $\eta = .20$). Figure 4 shows the result of the model at the between-person level. The interaction was in the same direction at the within-person level, although this term was not statistically significant ($\gamma = -0.09$, SE $= 0.08$, $t(672) = 1.12$, $p > 0.05$, $\eta = .04$).

Discussion

Much of trait RT can be characterized by the qualitative dimensions of valence and purpose, and much of episodic RT can be characterized by the same dimensions. However, in assessing episodic RT, one is not constrained by the qualities that emerge from trait questionnaires. Study 4 shows that other dimensions that emerge from episodic RT can also be important for adjustment. A previous multidimensional scaling of episodic RT identified self-focused or other-focused theme as a dimension that did not emerge from trait RT (Segerstrom et al., 2003, Study 2). In fact, most trait RT measures are self-focused, whether the focus is one's symptoms (depressive rumination; Nolen-Hoeksema, 1991), emotions (emotional approach coping; Stanton et al., 1994), or behaviors (rumination; Trapnell & Campbell, 1999). When episodic RT was characterized as to its degree of self- or other-focus in the present study, the effects of valence on depression were most apparent when thoughts were also self-focused. This finding suggests that the thematic content of repetitive thought may be more important than has been appreciated previously, and interpersonally focused measures of trait RT may be interesting foci of study, as their effects on well-being may differ from those of self-focused RT.

General discussion

Repetitive thought has largely been treated as trait-like and measured with questionnaires that capture distinct forms (e.g., worry). However, the present studies demonstrate the value of conceptualizing RT as an episodic phenomenon that, like other psychological phenomena, is informed by person and situation variables, as well as their interaction. Using this conceptualization, one can answer interesting questions about RT. For example, part of the reason that women who typically cope through emotional approach had less negative affect and less thought impact (e.g., intrusiveness) was because their episodic RT could be characterized by positive solving and negative searching. The interaction suggested that women high in emotional approach might have been more flexible in the ways that they were thinking about themselves and their worlds (Study 1). As another example, one's typical RT valence could either buffer against fluctuations in RT valence at particular time points or make one affectively vulnerable to these fluctuations (Study 3).

The concepts of fluctuation and flexibility are generally absent from trait conceptualizations of RT. Although prospective studies of the effects of trait RT are plentiful, they typically examine effects of baseline RT on changes over time in psychological symptoms or physical health, a design that is consistent with the idea that RT is stable and trait-like (see Watkins, 2008, for a review). In contrast, fluctuation and flexibility are important to episodic conceptualizations of RT. Furthermore, evidence from these studies suggests that these fluctuations are not determined solely by the environment (Studies 2 and 3). Therefore, the studies converge on the value of assessing episodic RT at multiple time points so as to capture fluctuation in RT.

Although trait and episodic views of RT differ in terms of the degree of focus on change in RT and the consequences of that change, there were important parallels between the qualities of trait and episodic RT that are most closely related to adjustment. In findings from trait models, "the valence of thought content during RT appears to be a key determinant of whether RT has constructive or unconstructive consequences" (Watkins, 2008, p. 185). Likewise, in the present studies, negative valence in episodic RT was consistently associated with more unconstructive consequences. This relationship was true both between and within people. Although effect sizes for effects acting between people ($r = .21–.52$) tended to be larger than those acting within people ($r = .09–.24$), the latter effects are more compelling insofar as each person acts as his or her own control for potential (non-RT) influences on psychological adjustment such as personality, temperament, and demographics.

Despite these robust effects of valence on adjustment, it has also been suggested that sometimes negatively valenced RT, even negative trait RT, can have constructive consequences. Watkins (2008) suggests that negative RT content combined with a concrete level of construal may be constructive and associated with fewer undesirable psychological consequences. However, in Study 2, we did not find that a manipulation of level of construal affected episodic RT. Furthermore, insofar as solving RT purpose resembles a concrete level of construal, in Studies 1 and 2, we found the opposite: that the combination of solving RT and negative content was the most unconstructive (c.f., Segerstrom et al., 2003, Study 3). We found more evidence

that positive trait RT may mitigate against the potential negative consequences of negative episodic RT. In Study 1, when women high in emotional approach coping (i.e., high trait positive RT) engaged in negative RT, it tended to be of a type (i.e., searching) that was associated with less negative and more positive affect. In Study 3, when law students were high in "trait" positive RT, the affective consequences of negative episodic RT were less severe (see Figure 3). More work on the question of when negative RT content leads to constructive versus unconstructive consequences is needed, but these studies provide an initial indication that trait and state RT may interact to influence psychological consequences. One possibility is that the beneficial effects of more positive "trait" RT are not due to the trait per se, but rather to the way that the trait changes the effects of episodic RT.

It is important to note that although these studies used different designs and samples, with the exception of Study 2, the effects on adjustment were essentially cross-sectional. Although RT qualities and adjustment changed in concert (Studies 3 and 4), it is possible that, for example, changes in depression were the causal factor in driving self-focused, negative repetitive thought rather than vice versa. Although lagged effects could have been tested here, the long lags between waves (weeks to months) would have meant implausible relationships (e.g., episodic RT in August predicting affect in October in Study 3 or February in Study 4). However, the methodology of repeated RT assessment can be adapted to much shorter time frames than those adopted here. Such studies could test lagged effects that could better speak to the questions of precedence and causality. Furthermore, although our experiment was unsuccessful in manipulating repetitive thought dimensions, other manipulations may be more successful. For example, people who are asked to write about positive aspects of stressful experiences can do so successfully, with positive consequences for mental and physical health (King & Miner, 2000; Stanton et al., 2002). The ability to manipulate episodic RT is ultimately important not only to determine causality definitively but also to develop episodic RT as a target for intervention to improve psychological and physical health.

Acknowledgements

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